(4) This is one of Mr. Maycock's many works on electrical subjects, and is intended to deal with the requirements of Grade I. and the final examinations in electric wiremen's work of the City and Guilds of London Institute. It is therefore essentially a book for beginners, and as such can be recommended. It contains a number of questions and their solutions.

OUR BOOKSHELF.

Careers for Our Sons. A Practical Handbook to the Professions and Commercial Life. Edited by the Rev. G. H. Williams. Pp. xii+564. Fourth edition. (London: A. and C. Black, 1914.) Price 5*s.* net.

THAT this book has reached a fourth edition since its first appearance ten years ago is an indication of its usefulness to parents and guardians. There are few more baffling tasks than to find a suitable opening for a boy whose school and college training are completed, but who has no clear idea of what he desires to do to secure a livelihood. To those who are face to face with the problem this complete and well-arranged compilation may be recommended confidently. Mr. Williams is an old schoolmaster who has supplemented his own wide experience by much valuable information gathered from a large number of experts.

Manks Antiquities. By P. M. C. Kermode and Prof. W. A. Herdman. Second edition. Pp. 150. (Liverpool: University Press, 1914.) Price 3*s.* net.

THE first edition of this book, which was out of print for some time, was reviewed at length in the issue of NATURE for June 14, 1906 (vol. lxxiv., p. 152). During the ten years since the original appearance of the work, the authors have explored several additional prehistoric sites, and a systematic survey of the antiquities of each parish has been undertaken by a committee of the Isle of Man Natural History and Antiquarian Society. From these and other sources much new material has been worked into the present edition of the book, which will prove of interest and service to the people of the island and their summer visitors.

Royal Society of London. Catalogue of Scientific Papers, 1800–1900. Subject Index. Vol. iii., Physics. Part II., Electricity and Magnetism. Pp. xv+927+vii. (Cambridge: The University Press, 1914.) Price 15*s.* net.

IN the review of the first part of the third volume of the Royal Society's catalogue of scientific papers, which appeared in NATURE on May 22, 1913 (vol. xci., p. 289), the general plan and scope of the work were described. It will be sufficient to say of this part that it completes the subject index on physics, deals with electricity and magnetism under the registration numbers 4900 to 6850, and contains 23,300 entries. This makes in all 56,644 entries for the subject physics for the years 1800–1900 inclusive.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Active Nitrogen.

IN view of the apparently inexplicable contradiction between the results of Tiede and Domcke (*Ber.*, 1913, 46, 340 and 4095) and Baker and Strutt (*Ber.*, 1914, 47, 801 and 1049) on this subject, Tiede and Domcke offered to visit London with their apparatus, and it was arranged that each pair of experimenters should repeat their experiments in presence of the other. This was done, and as a result it was agreed that Tiede and Domcke were justified in their statement that the addition of a trace of oxygen to the azide nitrogen increased the intensity of the glow. With the form of discharge vessel and the electrical equipment used by them it was possible to diminish the afterglow considerably, and then to restore the brilliancy of the glow by the addition of an infinitesimal trace of oxygen, liberated by gentle heat from silver oxide. When the amount of oxygen added exceeded this very small quantity, the glow entirely disappeared, as all former experimenters have agreed.

On the other hand, employing the form of discharge vessel used by Baker and Strutt, which has not been described in detail, but is better designed for obtaining the glow, it was not found possible to observe any distinct diminution in the intensity of the glow, even when the vessel was washed out several times with nitrogen prepared by Tiede and Domcke with their own materials, as used in the previous experiment. It is always possible that if the experiment had been more prolonged a different result might have been obtained.

It appears, therefore, that a sample of nitrogen may be made to give the glow more easily if it is mixed with a trace of oxygen. On the other hand, the purest nitrogen with which we have worked in our joint experiments in London is capable of giving a brilliant glow under the experimental conditions used by Baker and Strutt.

It seems possible that the effect of the infinitesimal trace of oxygen is to alter the conditions of discharge so as to make it more suitable for the production of active nitrogen. Prof. Warburg's observations of the effect of traces of oxygen on the kathode fall in nitrogen tends to confirm this idea. Possibly other substances than oxygen may be found eventually to produce the same effect.

H. B. BAKER.
ERICH TIEDE.
R. J. STRUTT.
EMIL DOMCKE.

Imperial College of Science and Technology,
London, July 2.

The Horns of the Okapi.

HITHERTO it has been considered that the horns of the male okapi, with the exception of the bare antler-like terminal caps, are permanently covered with hairy skin, like those of giraffes. The skin and skeleton of an old male okapi recently sent to Messrs. Gerrard, of Camden Town, by Dr. Christy, seem, however, to indicate that, extraordinary as it may appear, true horn-sheaths, like those of antelopes, are developed in at least some individuals. The skull, which, from the condition of the teeth, indicates an animal at least

© 1914 Nature Publishing Group

as old as the oldest of those figured in the respective memoirs of M. Fraipont and Sir Ray Lankester, carries the usual pair of conical bony horn-cores, which appear to have been devoid of terminal antler-like caps. In place of these being covered with hairy skin, the specimen, as mounted by Messrs. Gerrard, shows, however, that they were invested with (so far as I was able to determine) true horny sheaths, resembling candle-extinguishers, and recalling the terminal sheaths surmounting the hair-covered horn-cores of a prongbuck with newly developing horns figured by Dr. Sclater on p. 540 of the Proc. Zool. Soc. for 1880. Messrs. Gerrard were positive that the sheaths came with the skin, and as they appear to correspond in size with the bony cores, I see no reason to doubt the statement, more especially as the sheaths cannot apparently have pertained to any adult antelope.

Were it not for the fact that Dr. Christy is at present somewhere in the Belgian Congo, collecting on behalf of the Museum at Tervueren, I should have deferred making any statement on the subject until I had communicated with him. But as it may be months before I get a reply to a letter just dispatched (even if it ever reaches its destination), I have considered it advisable to put my observations on record, without, however, for the present, making them the basis of any deductions or speculations.

R. LYDEKKER.

Thorium Lead—An Unstable Product.

THE work of Boltwood and Holmes some years ago on the occurrence of lead and uranium in minerals rendered it very improbable that the end product of thorium could be lead. From recent generalisations, however, in respect to radio-elements and the periodic law, it is to be expected that the end products of the radio-active elements should all be isotopic with lead. One method of attacking the problem is the determination of the atomic weight of lead extracted from uranium and thorium minerals. On the assumption that radium G and thorium E are stable, a knowledge of the composition of the mineral from which the lead has been extracted enables one to calculate the expected value for the atomic weight of the lead. Comparison of this value with that found experimentally gives a means of testing whether radium G and thorium E are stable or not.

Using this method, Soddy and Hyman (Trans. Chem. Soc., 1914, vol. cv., p. 1402) obtained a result for lead from a thorite rich in thorium and poor in uranium, which indicates that thorium E is stable. On the other hand, Richards and Lembert made a determination on lead extracted from thorianite, which points to the instability of thorium E (see Fajans, *Heidelberger Sitz. Ber. A.*, 1914, *Abh.* 11). Holmes (NATURE, April 2, 1914) came to a similar conclusion by an examination of the ratio Pb/U_e for a series of analyses of radio-active minerals. If thorium E be stable, this ratio should be constant for minerals of the same geological age, but it should increase with the age of the mineral. Neither criterion was satisfied. In order to examine the question more fully, Holmes and the present writer examined the lead, uranium, and thorium contents of a series of radio-active minerals of Devonian age, from the same locality in Norway. The results of this investigation, shortly to be published, indicate very strongly that thorium E is unstable, and that it cannot therefore be regarded as the end product of thorium.

The present letter indicates how the above results have been applied by the writer to determine the half period value of thorium E, and the method has the advantage that it is quite independent of whether thorium lead (thorium E) is stable or not. A more detailed discussion of the question and its consequences will be published in the near future.

Amongst the minerals analysed by Holmes and the writer were several thorites and orangites, rich in thorium, and well adapted for an examination of the question of the stability of thorium E. These minerals being all of the same age, the total lead present may be regarded as the sum of the following three constituents: (1) Original lead (Pb_1), (2) uranium lead, (3) thorium lead. Further, whether uranium lead and thorium lead are stable or unstable, we can express the above statement as an equation thus:—

$$Pb = Pb_1 + \lambda . Th + \kappa . U.$$

Here Pb, U, and Th represent the content of the mineral in lead, uranium, and thorium respectively; λ is the amount of thorium E in equilibrium with 1 gram of thorium, and κ is the amount of uranium lead present in the mineral per gram of uranium. This last factor κ is constant for minerals of the same age, and varies in sympathy with the age of the mineral—this indicating that radium G is a stable product. The amount of original lead was assumed constant, since the minerals used were similar and from the same locality. Using the results of the analyses of three minerals, three equations are obtained by substitution in that above, and from these equations the values of λ, κ, and Pb_1 can be calculated. This calculation was performed with three different mineral combinations, and consistent results were obtained. The value of λ found was 4×10^{-5} gram. The value of κ found was 0·042, a result known to be correct from other considerations. Now it can readily be shown that the lead-producing power (calculated from the helium generation) of thorium is about 0·4 that of uranium. Whence, if thorium E is stable, the value of λ should be $0{\cdot}4 \times 0{\cdot}042 = 0{\cdot}017$. The low value ($4 \times 10^{-5}$) actually obtained seems to prove beyond question that thorium lead is unstable, and that it has a half period equal to 4×10^{-5} times that of thorium, or $4.10^{-5} \times 1{\cdot}5.10^{10} = 6.10^5$ years. It does not seem likely that thorium lead (thorium E) emits α rays, for these should have a range of about 3 cm., and would have been detected. If, on the other hand, it emits β rays, it is to be expected that bismuth would prove to be the end product of thorium. In any case, the systematic examination of radio-active minerals for bismuth seems highly desirable, for if it is the stable end product of thorium, the ratio Bi/Th will be found constant for minerals of the same geological age, and this ratio will vary in sympathy with the age of the mineral. Thus this ratio could be used for the determination of geological time just as that of lead to uranium has hitherto been used by Holmes ("The Age of the Earth," London; 1913) for the same purpose. If the bismuth isotope from thorium is unstable, the method indicated in this letter could be used to find its half period, and thus further information could be gathered as to the direction of the succeeding disintegration, *i.e.*, whether an α ray change brings the end product into Group III.B (Thallium) or a β ray change carries it still further to the Polonium Group (VI.B).

The one doubtful assumption in the present treatment is that in the minerals used for the calculation of λ, the percentage of original lead present is the same. This assumption is not without foundation, and in a forthcoming publication the writer will adduce evidence in support of the assumption in the case of the minerals used.

ROBERT W. LAWSON.

Radium Institute, Vienna.

© 1914 Nature Publishing Group